III. "The Anatomy of Symmetrical Double Monstrosities in the Trout." By Dr. J. F. GEMMILL. Communicated by Professor CLELAND, F.R.S.

IV. "Preliminary Communication on the Œstrous Cycle and the Formation of the Corpus Luteum in the Sheep." By F. H. A. MARSHALL. Communicated by Professor J. C. EWART, F.R.S.

V. "On the Composition and Variations of the Pelvic Plexus in *Acanthias vulgaris*." By R. C. PUNNETT. Communicated by Dr. GADOW, F.R.S.

VI. "On the Heat dissipated by a Platinum Surface at High Temperatures. IV.—High-Pressure Gases." By J. E. PETAVEL. Communicated by Professor SCHUSTER, F.R.S.

"On the Conductivity of Gases under the Becquerel Rays." By the Hon. R. J. STRUTT, Fellow of Trinity College, Cambridge. Communicated by LORD RAYLEIGH, F.R.S. Received December 15, 1900,—Read February 21, 1901.

(Abstract)

This paper gives an account of experiments on the relative conductivities of gases under the action of Becquerel radiation from various radio-active bodies.

It is first explained that in order to determine the constants fundamentally involved, the following conditions must be complied with :—

(1.) The E.M.F. applied to the conducting gas must be great enough to consume all the ions produced by the rays.

(2.) The pressure of the gas must be low enough to prevent any appreciable fraction of the radiation being absorbed by it.

If this is not so, then the layers of gas nearer the radio-active surface are exposed to stronger radiation than those further from it. The effective strength of the radiation will thus depend on the absorbing power of the gas at the particular pressure, and the observed ratio of the conductivities of two gases at the same pressure will not represent the ratio of their conductivities under radiation of a given strength.

The criterion applied to test whether the absorption was appreciable, was to examine the conductivity at different pressures. The range was ascertained within which the law of approximate proportionality to the pressure held good. In the experiments, care was taken to keep the pressure well within that range.

The kinds of radiation employed are there enumerated. They include,

(1.) The most penetrating kind of radiation, from radium—that deflectable by the magnet.

(2.) The easily absorbed kind of radiation from radium, which is not so deflectable.

(3.) and (4.) The radiation from two different samples of polonium.

(5.) The radiation from uranium salt.

The method of measurement is then described. It was in outline as follows :—

The layer of the radio-active body was placed at the bottom of a shallow brass box containing the gas under investigation. In this box and parallel to its flat top was a disc electrode, carried by a brass rod passing, air-tight, through an insulating ebonite stopper. The outside of the box was maintained at a high potential by a battery of small storage cells, and the current through the gas measured by the rate at which the potential of the insulated electrode rose, as indicated by a quadrant electrometer connected with it.

When it was desired to use only the penetrating rays from radium, a thin copper sheet, 0·007 cm. thick, intervened between the radio-active material and the gas. In measuring the relative conductivities of two gases, the rate of leak through one was observed at a known pressure. The apparatus was then exhausted, and the other gas admitted, and the rate of leak through it determined. This last rate of leak was corrected, so as to obtain the value which it would have had at the same pressure as that at which the first was examined. The rates of leak through the two gases were then comparable.

The mean results were as follows :—

Gas or vapour.	Density (relative).	Relative conductivity				
		Radium.		Polonium.		Uranium.
		Penetrating.	Easily absorbed.	I.	II.	
Hydrogen	0·0693	0·157	0·218	0·226	0·219	0·213
Air (assumed)	1·00	1·00	1·00	1·00	1·00	1·00
Oxygen	1·11	1·21	..	1·16		
Carbonic acid........	1·53	1·57	..	1·54		
Cyanogen	1·86	1·86	..	1·94		
Sulphur dioxide......	2.19	2·32	1·92	2·04	2·03	2·08
Chloroform	4·32	4·89	..	4·44		
Methyl iodide	5·05	5·18	3·74	3·51	3·47	3·55
Carbon tetrachloride..	5·31	5·83	..	5·34		

The general conclusions are that,

(1.) Both the deflectable and undeflectable rays give relative conductivities nearly, but certainly not quite, equal to the relative densities.

(2.) All the different kinds of undeflectable rays give the same relative conductivities, but the deflectable rays give somewhat different relative conductivities.

Both these kinds of rays are in this respect sharply distinguished from Röntgen rays, which give relative conductivities several times greater than the relative densities in the case of gases containing sulphur or the halogens.

"Some Physical Properties of Nitric Acid Solutions." By V. H. Veley, F.R.S., and J. J. Manley, Daubeny Curator, Magdalen College, Oxford. Received February 11,—Read March 7, 1901.

(Abstract.)

The results obtained by the authors on the electric conductivity of solutions of nitric acid have led them to continue their investigations on other physical properties of the same substance with a view of confirming the conclusions drawn therefrom.

In the present paper the properties examined are the densities, with especial reference to the contractions, and the refractive indices.

The various sources of error and their possible magnitude are discussed in full: for the densities, those of analysis, unavoidable in this case, temperature, errors of filling pyknometers both with acid and water; for the refractive indices, those of micrometer screws, divided circle, parallelism of quartz plates are more especially alluded to, as also the several effects likely to be produced by the various substances with which the acid solutions of necessity came into contact. The results obtained by both methods are given in a series of tables, and compared with those calculated from various equations for straight lines. These show that the physical properties are discontinuous at points corresponding very approximately to the concentrations required for simple molecular combinations *only* of nitric acid and water. In the case of the densities and contractions, the best defined points of discontinuity correspond to the composition of the hydrates with 14, 7, 4, 3, 1·5, and 1 molecular proportions of water; in the case of the refractive indices, the most marked points correspond to the 14, 7, and 1·5 hydrates.

The results for the contractions further confirm those for the electric conductivities as to a remarkable discontinuity at concentrations 95 per